IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	§	Confirmation No.: 1348
Canan Uslu Hardwicke et al.	§	
	§	Group Art Unit: 1792
Serial No.: 10/611,745	§	
	§	Examiner: David P. Turocy
Filed: June 30, 2003	§	
	§	
For: METHOD FOR FORMING A FLOW DIRECTOR ON A HOT GAS PATH COMPONENT	§	Atty. Docket: 121278-1
	§	
	§	

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Commissioner for Patents
P.O. Box 1450
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APPEAL BRIEF PURSUANT TO 37 C.F.R. §§ 41.31 AND 41.37

This Appeal Brief is being filed in furtherance to the Notice of Appeal mailed on April 11, 2008.

The Commissioner is authorized to charge the requisite fee of $510.00, and any additional fees that may be necessary to advance prosecution of the present application, to Account No. 07-0868.

Petition for Extension of time: This is a petition to extend the time for response to the OA mailed June 17, 2008. Please charge $120.00 for the one month extension of time plus all applicable fees associated with the submittal of this Amendment and any other fees applicable to this application to the Assignee's Deposit Account No. 07-0868.

1. REAL PARTY IN INTEREST

The real party in interest is General Electric Company, the Assignee of the above-referenced application by virtue of the Assignment to General Electric Company by Canan Uslu Hardwicke and Ronald Scott Bunker recorded at reel 014302, frame 0449, and dated 30th June, 2003. Accordingly, General Electric Company, as the parent company of the Assignee of the above-referenced application, will be directly affected by the Board's decision in the pending appeal.

2. RELATED APPEALS AND INTERFERENCES

Appellants are unaware of any other appeals or interferences related to this Appeal. The undersigned is Appellants' legal representative in this Appeal.

3. STATUS OF CLAIMS

Claims 1-24 and 27 are currently pending, are currently under final rejection and, thus, are the subject of this Appeal. Claims 25 and 26 are canceled previously.

4. STATUS OF AMENDMENTS

There are outstanding amendments to claims 1 and 17 to be considered by the Board. In the advisory action, the Examiner stated that the amendments proposed to claims 1 and 17 cannot be entered because the amendments raise new issues that require further consideration and/or search.

5. SUMMARY OF CLAIMED SUBJECT MATTER

This invention relates to hot gas path components for turbine assemblies. *See,* Application page 1, paragraph 2. More specifically, this invention relates to film cooling of hot gas path components and to secondary cooling between hot gas path components. *See, id.*

The Application contains two independent claims, namely, claims 1 and 17, which are the subject of this Appeal. The subject matter of these claims is summarized below.

With regard to the aspect of the invention set forth in independent claim 1, as amended in a response to a final action mailed on 16 January 2008, discussions of the recited features of claim 1 can be found at least in the below cited locations of the specification. By way of example, an embodiment in accordance with claim 1 provides a method for forming a plurality of discrete flow directors (*e.g.,* 20) on a component (*e.g.,* 10) comprising a wall (*e.g.,* 12) having at least one film-cooling hole (*e.g.,* 14) extending through the wall and defining an exit site (*e.g.,* 16). *See, e.g., id.* at paragraphs 0027 and 0045; *see also* FIGS. 1, 2 and 16. At least one of the discrete flow directors (*e.g.,* 20) is associated with each of the at least one film cooling hole (*e.g.,* 14). Each of the flow directors (*e.g.,* 20) comprises a three-dimensional projection disposed external to the cooling hole (*e.g.,* 14) and having limited dimensions in three directions. The method comprises depositing at least one layer (*e.g.,* 40) on the wall (*e.g.,* 12) of the component (*e.g.,* 10). The deposition includes shaping the at least one layer (*e.g.,* 40) in accordance with a predetermined shape to form each of the flow directors (*e.g.,* 20) that extends outwards from the wall (*e.g.,* 12) of the component (*e.g.,* 10) and through hot gas flow path to direct a coolant flowing from the film-cooling hole (*e.g.,* 14) toward a hot surface (*e.g.,* 22) of the wall, wherein the flow director (*e.g.,* 14) does not extend over the exit site (*e.g.,* 16).

With regard to the aspect of the invention set forth in independent claim 17, as amended in a response to a final action mailed on 16 January 2008, discussions of the recited features of claim 17 can be found at least in the below cited locations of the specification. By way of example, a method for forming a plurality of discrete flow directors (*e.g.,* 20) on a turbine component (*e.g.,* 10) comprising a wall (*e.g.,* 12) having a cold surface (*e.g.,* 21) and a hot surface (*e.g.,* 22), wherein at least one film-cooling hole (*e.g.,* 14) extends through the wall (*e.g.,* 12) for flowing a coolant from the cold surface

(*e.g.*, 21) to the hot surface (*e.g.*, 22). The film-cooling hole (*e.g.*, 14) defines an exit site (*e.g.*, 16) in the hot surface (*e.g.*, 22) of the wall. At least one of the discrete flow directors (*e.g.*, 20) is associated with each of the at least one film cooling hole (*e.g.*, 14). Each of the flow directors (*e.g.*, 20) comprises a three-dimensional projection disposed external to the cooling hole (*e.g.*, 14) and having limited dimensions in three directions. The method comprises depositing at least one layer (*e.g.*, 40) on the wall (*e.g.*, 12) of the component (*e.g.*, 10). The deposition includes shaping the at least one layer (*e.g.*, 40) in accordance with a predetermined shape to form each of the flow directors (*e.g.*, 20) that extends outwards from the wall (*e.g.*, 12) of the component and through hot gas flow path to direct the coolant flowing from the film-cooling hole (*e.g.*, 14) toward the hot surface (*e.g.*, 22) of the wall, wherein the flow director (*e.g.*, 20) does not extend over the exit site (*e.g.*, 16).

A benefit of the invention, as recited in these claims, is the method for forming a plurality of discrete flow directors, which provide film cooling for hot gas path components with improved cooling effectiveness. The discrete flow directors direct and maintain the coolant flow along the hot surface of the gas path component, to enhance the protective "film" effectiveness.

6. GROUND OF REJECTION TO BE REVIEWED ON APPEAL

First Ground of Rejection for Review on Appeal:

Appellants respectfully urge the Board to review and reverse the Examiner's first ground of rejection in which the Examiner rejected Claims 1-5, 10-20, 23, 24 and 27 under 35 U.S.C. §102(b), as being anticipated by Bunker et al. (U.S. Patent No. 6,234,755; hereinafter "Bunker").

Second Ground of Rejection for Review on Appeal:

Appellants respectfully urge the Board to review and reverse the Examiner's second ground of rejection in which the Examiner rejected Claims 1-5, 10-20, 23, 24 and 27 under 35 U.S.C. §103(a) as being unpatentable over Bunker.

Third Ground of Rejection for Review on Appeal:

Appellants respectfully urge the Board to review and reverse the Examiner's third ground of rejection in which the Examiner rejected Claims 6-9, 21 and 22 under 35 U.S.C. §103(a) as being unpatentable over Bunker in view of Sabol et al. (U.S. Patent No. 6,060,174 ; hereinafter "Sabol").

7. ARGUMENT

As discussed in detail below, the Examiner has improperly rejected the pending claims. Further, the Examiner has misapplied long-standing and binding legal precedents and principles in rejecting the claims under Section 102 and 103. Accordingly, Appellants respectfully request full and favorable consideration by the Board, as Appellants strongly believe that claims 1-24 and 27 are currently in condition for allowance.

A. Ground of Rejection No 1:

Claims 1-5, 10-20, 23, 24 and 27 are rejected under 35 U.S.C. §102(b) as being anticipated by Bunker.

Independent claims 1 and 17 and claims depending therefrom

The amended independent claim 1 recites, *inter alia*, "forming a plurality of discrete flow directors on a component comprising a wall having at least one film-cooling hole extending through the wall and defining an exit site, wherein at least one of the

discrete flow directors is associated with each of the at least one film cooling hole and wherein each of the flow directors comprises a three-dimensional projection disposed external to the cooling hole and having limited dimensions in three directions."

The amended independent claim 17 recites, *inter alia*, "forming a plurality of discrete flow directors on a turbine component comprising a wall having a cold surface and a hot surface, wherein at least one film-cooling hole extends through the wall for flowing a coolant from the cold surface to the hot surface, the film-cooling hole defining an exit site in the hot surface of the wall, wherein at least one of the discrete flow directors is associated with each of the at least one film cooling hole and wherein each of the flow directors comprises a three-dimensional projection disposed external to the cooling hole and having limited dimensions in three directions."

Appellants thus submit that amended independent claims 1, and 17 recite, in generally similar language, forming a plurality of discrete flow directors, wherein at least one of the discrete flow directors is associated with each of the at least one film cooling hole and wherein each of the flow directors comprises a three-dimensional projection. *See* Application, paragraphs [0033] [0034] [0036] and [0045]; Figs. 3-7, Figs. 16-17.

The Examiner argued that Bunker discloses a method of forming a flow director (by forming a slot over the holes) on a component comprising a wall by depositing at least one layer on the wall of the component, wherein said deposition includes shaping the layers in accordance with the predetermined shape of the flow director and therefore forming the flow director that extends radially outwards from the initial wall of the component and into a hot gas flow path. Further, the Examiner argued that there are two walls to the slot and therefore there is a plurality of discrete flow directors for each slot and one of the flow directors is associated with one of the film cooling holes. The Examiner cited passages at col. 2, lines 20-24 and lines 50-60, col. 4 lines 15-22, and

Figure 3 of Bunker in support of the rejections. Additionally, the Examiner notes that Bunker discloses forming a slot over a row of holes and discloses multiple rows of holes and therefore teaches multiple slots, each over the multiple rows of holes by citing col. 2, lines 45-50 of Bunker.

Appellants respectfully submit that first Bunker fails to teach a plurality of discrete flow directors, wherein at least one of the *discrete* flow directors is associated with *each* of the at least one film cooling hole. Rather, Bunker teaches forming a single continuous slot within a high temperature surface of the substrate such that the cooling holes are within the slot. The cooling holes are between the two walls of the slot. *See*, Bunker, col. 6, lines 49-59, and Figure 3. Specifically, Bunker discloses:

> Coolant air 66 flows upwardly from the cooler surface through film cooling holes 68. The break-out region of the holes is designated as element 69 in FIG. 3. The holes have an average throat diameter d.
>
> Substrate 60 is partially coated with a bond layer 70 and an overlying TBC 72. In this embodiment, slot 74 is formed within the bond layer and TBC, and has a depth D. Usually (but not always), the side-walls 76, 78 of the slot are substantially perpendicular to surface 62 of the substrate. (Thus, the side-walls are usually substantially perpendicular to the bottom surface 80 of slot 74).
>
> Bunker, col. 6, lines 49-59, (emphasis added).

Bunker teaches a slot that would extend partly inwardly and perpendicularly from each hot surface toward the cooler surface. The slot also extends longitudinally along a selected dimension of holes. Further, the slot serves as a spillway trench for coolant air exiting cooling holes. *See*, Bunker, col. 6, lines 27-35 and col. 7, lines 1-10. The slot, however, is a depression on the surface. The walls of the slot do not project outward from the surface, but depend into the surface unlike the discrete flow directors that project outward from the surface. Therefore, the walls of the slot are not projections on

the surface as the discrete flow directors. The three-dimensional discrete flow directors are projecting features on top of the surface.

Clearly, Bunker does not teach discrete flow directors, with at least one discrete flow director associated with each film cooling hole and wherein each of the flow directors comprises a three-dimensional projection. Appellants respectfully submit that a prima facie case of anticipation cannot be supported by Bunker against claims 1 and 17.

Therefore, it is submitted that independent claims 1 and 17 and their dependent claims are allowable and the appellants respectfully request the Board to direct the Examiner to enter the amendments and reconsider rejection of the claims.

B. Ground of Rejection No 2:

Claims 1-5, 10-20, 23, 24 and 27 are rejected under 35 U.S.C. §103(a) as being unpatentable over Bunker.

As discussed above, Bunker fails to teach a plurality of discrete flow directors, wherein at least one of the *discrete* flow directors is associated with *each* of the at least one film cooling hole and wherein each of the flow directors comprises a three-dimensional projection. Rather, Bunker teaches forming a single continuous slot within a high temperature surface of the substrate such that the cooling holes are within the slot. The walls of the slot do not project outward from the surface, but depend into the surface unlike the discrete flow directors that project outward from the surface. Therefore, the walls of the slot are not projections on the surface as the discrete flow directors.

Therefore, it is submitted that independent claims 1 and 17 and their dependent claims are allowable and the appellants respectfully request the Board to direct the Examiner to enter the amendments and reconsider rejection of the claims.

C. Ground of Rejection No 3:

Claims 6-9, 21 and 22 are rejected under 35 U.S.C. §103(a) as being unpatentable over Bunker in view of Sabol.

As discussed above, Independent claims 1 and 17 are believed to be in condition for allowance. Claims 6-9 depend from claim 1 directly or indirectly and therefore similarly allowable. Claims 21 and 22 depend from claim 17 directly or indirectly and therefore similarly allowable.

Conclusion

Appellants respectfully submit that all pending claims are in condition for allowance. However, if the Examiner or Board wishes to resolve any other issues by way of a telephone conference, the Examiner or Board is kindly invited to contact the undersigned attorney at the telephone number indicated below.

Respectfully submitted,

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8. APPENDIX OF CLAIMS ON APPEAL

Listing of Claims:

1. A method for forming a plurality of discrete flow directors on a component comprising a wall having at least one film-cooling hole extending through the wall and defining an exit site, wherein at least one of the flow directors is associated with respective one of the at least one film cooling hole and wherein each of the flow directors comprises a three-dimensional projection disposed external to the cooling hole and having limited dimensions in three directions, said method comprising depositing at least one layer on the wall of the component, wherein said deposition includes shaping the at least one layer in accordance with a predetermined shape to form each of the flow directors that extends outwards from the wall of the component and through hot gas flow path to direct a coolant flowing from the film-cooling hole toward a hot surface of the wall, wherein the flow director does not extend over the exit site.

2. The method of Claim 1, wherein said deposition comprises depositing a plurality of layers on the wall of the component and shaping the layers in accordance with the predetermined shape to form the flow director.

3. The method of Claim 1, wherein the wall has a cold surface and a hot surface, wherein the at least one film-cooling hole extends through the wall for flowing a coolant from the cold surface to the hot surface, and wherein said deposition comprises depositing the at least one layer on the hot surface of the wall.

4. The method of Claim 3, wherein the flow director comprises a flow modifier adapted to direct the coolant flowing from the film-cooling hole and out of the exit site toward the hot surface of the wall.

5. The method of Claim 3, wherein the flow director comprises a ridge extending along at least a portion of the exit site and further extending to a position downstream of the exit site.

6. The method of Claim 1, wherein said deposition comprises:

delivering a mixture through a nozzle onto the wall to form the layer, the mixture comprising a powder dispersed in a liquid medium.

7. The method of Claim 6, further comprising heating the layer.

8. The method of Claim 6, wherein said deposition further comprises displacing the nozzle relative to the wall to form the at least one layer in accordance with the predetermined shape.

9. The method of Claim 8, wherein said deposition further comprises controlling said movement of the nozzle relative to the wall to form the at least one layer in accordance with the predetermine shape.

10. The method of Claim 1, wherein said deposition is performed a plurality of times at a respective plurality of positions on the wall of the component to form a plurality of flow directors on the wall of the component.

11. The method of Claim 1, wherein the at least one layer comprises a metal.

12. The method of Claim 1, wherein the at least one layer comprises a ceramic.

13. The method of Claim 1, wherein the at least one layer comprises a material selected from the group consisting of metals, ceramics and combinations thereof.

14. The method of Claim 1, wherein the component and a second component define a secondary cooling slot for receiving and guiding a secondary coolant flow, and wherein the flow director is adapted to enhance the secondary coolant flow along at least one of the component and the second components within the secondary coolant slot.

15. The method of Claim 1, wherein said deposition is performed using a process selected from the group consisting of chemical vapor deposition, ion plasma deposition, electron beam physical vapor deposition, electroplating and combinations thereof.

16. The method of Claim 15, wherein said deposition further comprises at least one masking step.

17. A method for forming a plurality of discrete flow directors on a turbine component comprising a wall having a cold surface and a hot surface, wherein at least one film-cooling hole extends through the wall for flowing a coolant from the cold surface to the hot surface, the film-cooling hole defining an exit site in the hot surface of the wall, wherein at least one of the flow directors is associated with respective one of the at least one film cooling hole and wherein each of the flow directors comprises a three-dimensional projection disposed external to the cooling hole and having limited dimensions in three directions, said method comprising:

depositing at least one layer on the wall of the component, wherein said deposition includes shaping the at least one layer in accordance with a predetermined shape to form each of the flow directors that extends outwards from the wall of the component and through hot gas flow path to direct the coolant flowing from the film-cooling hole toward the hot surface of the wall, wherein the flow director does not extend over the exit site.

18. The method of Claim 17, wherein said deposition comprises depositing a plurality of layers on the wall of the component and shaping the layers in accordance with the predetermined shape to form the flow director.

19. The method of Claim 17, wherein the flow director comprises a flow modifier adapted to direct the coolant flowing from the film-cooling hole and out of the exit site toward the hot surface of the wall.

20. The method of Claim 17, wherein the flow director comprises a ridge extending along at least a portion of the exit site and further extending to a position downstream of the exit site.

21. The method of Claim 17, wherein said deposition comprises:

delivering a mixture through a nozzle onto the wall to form the layer, the mixture comprising a powder dispersed in a liquid medium;

displacing the nozzle relative to the wall to form the at least one layer in accordance with the predetermined shape; and

controlling said movement of the nozzle relative to the wall to form the at least one layer in accordance with the predetermine shape.

22. The method of Claim 21, further comprising heating the layer.

23. The method of Claim 17, wherein said deposition is performed a plurality of times at a respective plurality of positions on the wall of the component to form a plurality of flow directors on the wall of the component.

24. The method of Claim 1, wherein forming the flow director comprises forming the flow director on a hot gas path surface of the component.

25. (canceled)

26. (canceled)

27. The method of Claim 1, wherein the flow director is rounded, or polygonal, or triangular, or combinations thereof.

28. (canceled)

9. APPENDIX OF EVIDENCE

None.

10. **APPENDIX OF RELATED PROCEEDINGS**

None.